Rehabilitation after Hip Fracture for Nursing Home Residents: A Controlled Feasibility Trial

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Abstract

Background: This study compared function three-months after hip fracture surgery between nursing home residents participating in a 10-week outreach rehabilitation program and those receiving usual care. Function, health-related quality of life (HRQL) and mortality were also compared over 12-months and outreach program feasibility was assessed.

Methods: A feasibility trial was undertaken in Canadian nursing homes; of 77 participants, 46 were allocated to Outreach and 31 to Control prior to assessing function or cognition. Outreach participants received 10 weeks of rehabilitation (30 sessions) and Control participants received usual post-hospital fracture care in their nursing homes. The primary outcome was the Functional Independence Measure Physical Domain($FIM_{physical}$) score three-months post-fracture; we also explored FIM Locomotion and Mobility. Secondary outcomes were FIM scores, EQ-5D-3L scores and mortality over 12-months. Program feasibility was also evaluated.

Results: The mean age was 88.7±7.0 years, 55(71%) were female and 58(75%) had severe cognitive impairment with no significant group differences($p>0.14$). Outreach participants had significantly higher FIM Locomotion than usual care ($p=0.02$), but no significant group differences were seen in $FIM_{physical}$ or FIM Mobility score three-months post-fracture. In adjusted analyses, Outreach participants reported significant improvements in all FIM and EQ-5D-3L scores compared to Control participants over 12-months($p<0.05$). Mortality did not differ by group($p=0.80$). Thirty(65%) outreach participants completed the program.

Conclusion: Our feasibility trial demonstrated that Outreach participants achieved better locomotion by three-months post-fracture compared to participants receiving usual post-fracture

care; benefits were sustained to 12-months post-fracture. In adjusted analyses, Outreach participants also showed sustained benefits in physical function and HRQL.

Key words – Hip Fracture, Nursing Home, Rehabilitation, Recovery

INTRODUCTION

Hip fractures are significant injuries typically seen at older ages; the incidence of hip fracture is increasing with our aging population.(1-3) Nursing home residents are at substantially increased risk of hip fractures,(4-7) but are frequently excluded from interventional rehabilitation studies.(8)

We previously reported that Canadian nursing home residents experience relatively worse outcomes than community-dwelling seniors after hip fracture surgery;(9) similar findings were reported in a recent American Medicare review.(10) Cognitive impairment is common in this frail sub-set of people with hip fracture;(11) thus they frequently have less access to rehabilitation.(10;12;13)

Limited evidence suggests that patients with cognitive impairment can benefit from rehabilitation, but most published work has included community-dwelling participants with cognitive impairment.(14-16) Few studies have examined the impact of structured rehabilitation after hip fracture for people who lived in a nursing home before their hip fracture.(17)

We undertook a feasibility study to determine the capacity for nursing home residents to participate in structured rehabilitation after hip fracture. The primary objective was to compare functional outcomes (e.g., walking and transfers) at three-months after hip fracture between nursing home residents who participated in a 10-week outreach rehabilitation program and those who received usual post-fracture care. We also compared functional outcomes, health-related quality of life (HRQL) and mortality between groups over the initial 12-months after hip fracture surgery. Finally, we assessed program feasibility in terms of recruitment**,** participation and completion.

METHODS

Setting and Subjects: Participants were recruited from three tertiary hospitals in a metropolitan health zone in Canada, which serves 1.5 million people with universal healthcare coverage. Eligible participants were nursing home residents who were ambulatory before their hip fracture. Nursing home residents were excluded if they were non-English speaking and only ambulated from bed to wheelchair pre-fracture. There were no cognitive eligibility criteria. Proxy respondents provided written informed consent for study participants. Hospital care and length of stay followed a standardized regional care pathway; the surgical hospital was unaware of study participation.

Study Design: Participants were to be assigned to the outreach intervention (hereafter 'Outreach') or Control (hereafter 'Control') groups at a 2:1 ratio based on the hospital to which they were admitted. Each hospital was designated as a Control hospital on a rotating basis. Because the intervention program was time intensive, not all participants who were to be allocated to Outreach could be accommodated by the outreach teams. Thus, these participants were also allocated to the Control group. Allocation was done without knowledge of participants' functional or cognitive status to avoid allocation bias. Clinical assessors collected outcomes without knowledge of allocation status and investigators were blinded to allocation status and outcomes. A non-randomized design was selected because the outreach rehabilitation intervention required feasibility assessment; thus a randomized trial was deemed premature.

Enrollment commenced in February 2011. In 2012, the provincial government changed admission criteria for nursing home residents, which classified many nursing home residents as only requiring supportive living. Supportive living facilities had less healthcare provider support,

so residents from these facilities were not eligible for the outreach intervention because they could not return to their residential facility within the first 2 postoperative weeks. Enrollment ended in 2015 due to low recruitment because fewer nursing home residents were ambulatory pre-fracture as a result of these policy changes. Ethics approval was obtained from the regional health ethics board (Pro00010006).

Protocol for Control Participants: Participants allocated to the Control group received usual post-fracture care in their nursing home following discharge from the surgical hospital. Nursing home rehabilitation personnel completed rehabilitation service time logs, but no directions for post-fracture rehabilitation were provided by either the outreach team or the investigators.

Protocol for Outreach Rehabilitation Intervention: Participants allocated to the Outreach group received 10 weeks of rehabilitation (3 sessions/week) in their nursing home following discharge from the surgical hospital. Outreach rehabilitation teams consisted of a licensed physical therapist (PT) and two physical therapy assistants (PTAs) who were hired and trained by the investigators to provide the rehabilitation program. Rehabilitation started once the nursing home facility agreed to have the outreach team provide rehabilitation onsite and the participant and/or their proxy respondent provided signed informed consent. The rehabilitation program was structured into bed mobility, transfers, ambulation and functional exercises,(14;16;18) but the outreach team PT could individualize the content and difficulty level to participant capacity (Appendix 1). On the first day of each week, the PT and one PTA assessed and treated the participant after determining that week's rehabilitation program. For the next two sessions of that week, PTAs provided treatment under indirect supervision (i.e., PT was available by phone as needed). Rehabilitation session times were posted so facility staff were aware of when the Outreach team would be present. Most treatment sessions occurred post-morning routine (i.e.

eating and dressing completed) up to early afternoon to facilitate participation. The PT progressed the program weekly based on participant's tolerance. In some cases, only one PTA was required per participant in the final four weeks as participants regained functional independence. Program content, duration and level of assistance required was documented at each session.

Evaluation: Proxy respondents were used for all telephone assessments, which were completed at study entry, three-, six-, and 12-months post-fracture to provide information regarding participant status. Proxy respondents also provided pre-fracture function, demographic, comorbid status, social network, and general functional information (pre-fracture indoor/outdoor walker; pre-fracture gait aids/walking assistance) as well as specifying their relationship with the participant at the initial interview. The same proxy respondent provided information at each subsequent interview to a telephone assessor who was unaware of group allocation.

Outcome Measures

***Functional Independence Measure Physical Domain ($FIM_{physical}$)*:** The $FIM_{physical,}$ commonly used to measure recovery after hip fracture and function in nursing home settings, assesses disability level based on assistance required to safely perform self-care (6 items), sphincter control (2 items), transfers (3 items), and locomotion (2 items) with higher scores reflecting more functional independence.(19-23) It detects small changes in dependence,(24-26) and is validated for telephone administration and proxy reporting.(27-29) Only the $FIM_{physical,}$ score was used as high levels of cognitive impairment that were likely immutable were expected in this cohort. We also examined scale-level changes in FIM Locomotion and Mobility as these were the focus of the outreach intervention. The FIM locomotion scale examines level of assistance required for

stairs and 50 feet of walking while the FIM mobility scale examines level of assistance required for transfers from bed/chair, toilet and tub/shower.

Euro Quality of Life Three Level (EQ-5D-3L): The EQ-5D-3L, a generic health utility instrument used to measure HRQL, consists of five domains (mobility, self-care, pain and discomfort, depression and anxiety, and usual activities) that can be reported as an index score ($EQ\text{-}5D\text{-}3L_{index}$). The EQ-5D-3L is validated for use with older populations, including hip fracture, but its use with proxy respondents is more limited.(30;31) Previous work suggests that family members provide reasonable responses to less-observable domains.(32)

Primary Outcome: The pre-specified primary comparison between groups was the $FIM_{physical}$ at three months post-fracture when the outreach intervention completed. We also did an exploratory group comparison of FIM Locomotion and Mobility scale scores at three months post-fracture.

Secondary Outcomes: The pre-specified secondary comparison were 1) $FIM_{physical}$ scores and EQ-5D-3L scores over 12-months post-fracture between groups to determine sustainability of the Outreach intervention and 2) 12-month mortality. We also explored FIM Locomotion and Mobility scale scores over the initial 12-months post-fracture between groups.

Feasibility Assessment: Recruitment, participation and completion of the outreach intervention were evaluated to determine program feasibility for nursing home residents. We documented the completion, duration and content of each session as well as any adverse effects (e.g., falls).

Data Analysis: Baseline evaluations were undertaken to assess for systematic differences (chi-square and t-test for categorical and continuous data respectively) between groups. For three-month outcomes, we used independent t-tests to compare Outreach and Control group scores. As a feasibility trial, we also compared effect sizes (Cohen's D) between groups of the a) absolute

FIM scores at three months post-fracture and b) percentage change in these scores from pre-fracture to three months post-fracture (small effect size=0.2-0.49; moderate effect size=0.5-0.8; large effect size>0.80). Effect sizes were included as the response to the intervention was unknown, but expected to be lower than that seen in community-dwelling patients recovering from hip fracture.

Linear mixed (LM) modeling was used to examine the pattern of outcomes over four time points (baseline, three- and 12-months post-surgery) because non-linear equations provided the best fit for predicting outcomes over 12 months. LM modeling also allowed use of all available data at each time; models included parameters that estimated outcomes before surgery and the rate of change during recovery. The square of time was included as an estimate of change in the recovery rate because of the quadratic relationship over time for outcomes. Models had two levels - one level for within-individual change over time and the other for between-individual differences in change over time. In exploratory multivariable LM models, variables of interest other than group allocation included age (less than vs. 85 years older), sex, comorbidities (less than vs. three or more conditions) pre-fracture walker type (indoor vs. outdoor) and pre-fracture support/aid use; these were included based on both forward selection and backward elimination procedure. Group (Outreach vs Control) was retained in all models. Interaction terms were investigated, but all were non-significant. All statistical analyses were performed using SPSS version 24.0 (IBM Corp., Armonk, NY, USA), utilizing 2-tailed tests and a significance level of $\alpha<0.05$.

RESULTS

Participant Characteristics: Over the recruitment period, 141 potential participants were identified. Of these, proxy respondents refused participation of 23 (16%) patients. For an additional 41 (29%) patients, proxy respondents were either not available to provide timely written consent or no appropriate proxy respondent could be identified. Overall, 77 (55%) participants were enrolled with 46 allocated to the Outreach group and 31 participants allocated to Control; there were no significant group differences at study entry (Table 1). The mean age of the cohort was 88.7±7.0 years, 55 (71%) were female and 58 (75%) had severe cognitive impairment as measured by the Mini-Mental Status Examination (i.e., scores <13).(33) Prior to fracture, both groups reported high levels of dependence based on $FIM_{physical}$ scores, but 42% of participants were independently walking (i.e., FIM Locomotion scores >5; p=0.91 for group differences).

Three-Month Results: Within three-months of fracture, 16 died (21%; 10 [22%] Outreach, 6 [19%] Control), and six were withdrawn from the study (8%; 4 [9%] Outreach, 2 [6%] Control). One Outreach participant was withdrawn due to a fall and re-fracture within one week of return to the nursing home before the program started and the other five withdrew due to deteriorating health status (Figure 1).

Of 55 retained participants, there was no significant difference in the $FIM_{physical}$ score or in FIM Mobility domain at three months post-fracture, but Outreach participants scored significantly higher in FIM Locomotion scores (Table 2). Both groups reported substantial losses in $FIM_{physical}$ scores and in FIM Mobility and Locomotion scale scores relative to pre-fracture. Comparison of effect sizes for absolute FIM scores and percentage change from pre-fracture scores demonstrated a small to moderate effect size of the intervention relative to usual care in

all three FIM scores (Table 2). The Control group reported lower functional independence and higher losses in function from pre-fracture levels at three-months relative to the Outreach group.

12-Month Results: In unadjusted LM modelling over 12-months, there were no significant group differences in FIM scores ($FIM_{physical}$, Locomotion or Mobility) nor in HRQL as measured by the EQ-5D=3L (Table 3). However, in adjusted analyses, Outreach participants reported significant improvements in all FIM scores as well as HRQL compared to Control participants (Table 3). Over 12-months, mortality was substantial, but not significantly different between groups (12 [25%] Outreach; 10 [29%] Control; p=0.80) (Figure 1).

Outreach Participation and Retention: The median time to identify and contact proxy respondents, obtain written consent and commence the outreach program in the nursing home was 15 days (Interquartile Range [IQR] 8, 27.8 days). Of participants allocated to the intervention (n=46), 11 (24%) did not start the program; of these, seven (15%) died shortly after return to the residential facility, one (2%) re-fractured as previously described and three (7%) deteriorated between hospital discharge and planned intervention start. Family members withdrew these four survivors from the study; thus, they did not contribute to the study results. Five (11%) participants only completed four to six weeks of the intervention before stopping due to lack of progression (i.e., increasing physical dependence such that participants could not tolerate the intervention; [n=4] or combative behavior related to cognitive issues; [n=1]). These five participants' outcomes were included in the analysis.

Of participants who started the outreach program (n=35), 84% completed three sessions/week in week one. Thirty (65%) participants completed the 10-week program with 90% completing three sessions/week. Session duration was relatively unchanged with a mean duration of 48±19

minutes in week one and 50±16 minutes in week 10. Over 10-weeks, the program shifted from bed mobility and short bouts of ambulation to more functional exercises and longer, more frequent ambulation sessions (Table 4). No adverse effects occurred related to the program.

The Control group received substantially lower amounts of rehabilitation than the Outreach group on return to their nursing home, reporting a median of 17.5 (IQR 2.0, 29.1) minutes of ambulation and 51.6 (IQR 14.8, 63.2) minutes of transfer/functional exercises with rehabilitation staff weekly.

DISCUSSION

Our controlled feasibility trial of a structured 10-week outreach rehabilitation intervention for nursing home residents who sustained hip fractures and survived their hospital stay demonstrated that although there was no overall difference in $FIM_{physical}$ scores post-intervention, Outreach participants achieved improved locomotion levels within three-months of hip fracture with a small to moderate effect size in all FIM scores of the outreach intervention relative to usual care. The improvement in locomotion was sustained to 12-months post-fracture compared to participants who received usual post-fracture care. In adjusted analyses, Outreach participants also showed sustained benefits in physical function and HRQL as measured by the FIMmotor and EQ-5D-3L.

This study is important as evidence is sparse regarding the impact of rehabilitation after hip fracture for nursing home residents.(10;13;16;17) Limited evidence has demonstrated the benefits of rehabilitation for patients with mild to moderate dementia who sustained a hip fracture.(14;15) Many participants in these previous studies were community-dwelling, despite living with cognitive impairment. This feasibility trial is one of the first to focus specifically on

nursing home residents, the frailest group of people who sustain hip fracture. Indeed, because of health policy changes, our current cohort was even older and more functionally dependent pre-fracture than participants of our earlier observational cohort of in nursing home residents who sustained a hip fracture.(12) Further, this health policy change resulted in fewer candidates being eligible for participation, adding to the challenges of studying recovery in nursing home residents. However, despite lower pre-fracture health status, substantial cognitive impairment and older age, 76% of Outreach participants commenced the program and 65% completed 10-weeks of structured rehabilitation three times/week. In comparison to the Control group, which represented usual post-fracture care delivered in nursing homes in Alberta, the Outreach group received substantially more rehabilitation.

Perhaps somewhat surprisingly, the modest benefits achieved during rehabilitation were sustained for 12 months, well after structured rehabilitation ended. Some of the sustained benefit might be attributed to survivor benefit (i.e., those who survived likely had better health and function). However, as most participants only achieved modified dependence in ambulation and transfers, facility staff had to continue to assist residents in ambulation and transfers to sustain benefits. Our findings suggest ambulatory nursing home residents should be considered potentially eligible for rehabilitation after hip fracture surgery. Future research should likely include nursing home care providers as active rehabilitative team members to potentially improve recovery further. We previously demonstrated that the nursing home staff saw value in providing rehabilitation to these residents.(34)

It is important to highlight that most participants had moderate to severe dementia. We used no cognitive criteria for program eligibility, but only one participant had the outreach program discontinued due to combative behavior with the outreach team. It is also important to note that

individual rehabilitation sessions were on average greater than 40 minutes even when participants had limited exercise tolerance in the initial weeks of the program. The outreach team facilitated participant compliance by allowing adequate time to perform the activities including rest periods as needed.

This is one of the first interventional studies focused on nursing home residents' recovery after hip fracture; however several limitations are notable. As participants weren't able to provide independent informed consent, available and appropriate proxy respondents were identified to provide signed informed consent before contacting nursing home staff to set up the outreach program. This delayed commencing the outreach program and may have contributed to some participants' deteriorating status that precluded participation in the program or reduced the benefit of participation in the program on functional recovery. Future studies should consider methods to expedite the consent process to avoid delays.

We also had broad inclusion criteria and did not specify pre-fracture levels of independence for mobility and ambulation. Future studies could consider selection criteria for rehabilitation based on pre-fracture mobility levels. This was a small trial, so further evaluation is needed to see if others achieve similar results. Changes in local health policy restricted our ability to enroll participants who lived in supportive living residential settings due to cognitive impairment, but who had functional capacity such that formal nursing care wasn't required (i.e., basic supportive care could be provided by health care aides and licensed practical nurses). These individuals would have been previously eligible for the outreach intervention and might be expected to benefit most from post-fracture rehabilitation. Thus, our results may only generalize to older residents of nursing homes who require daily nursing care.

Although we used a comparative study design, it was not randomized; thus it is possible that there were unmeasured group differences that may have affected our outcomes. Allocation to Outreach or Control groups was done without knowledge of participants' pre-fracture function or cognitive status and groups appeared similar pre-fracture. This was a feasibility study that also assessed treatment fidelity and impact of the rehabilitation intervention. Our findings suggest that a well-powered randomized trial would be worthwhile in nursing home residents.

In addition, our validated outcome measures focused on overall physical function. Although a broader intervention that included nutritional supplementation and other medical care might have improved patient outcomes further, this was beyond the scope of our project. We focused on mobility as our primary goal to allow patients to return to walking and independent mobility post-fracture. To determine the intervention impact on locomotion and mobility, we also evaluated these FIM scales independently in addition to the $FIM_{physical}$ score. This evaluation approach has not been formally validated, so our scale-specific results should be interpreted with caution. Future trials should choose outcomes focused on ambulation and transfers as residents with moderate to severe cognitive impairment are not likely to experience significant recovery of self-care or sphincter control.

Finally, to date, we have only assessed the program's functional impact. Understanding the cost/cost-effectiveness would also be beneficial to determine the feasibility of incorporating this approach into a health care system. A health economic analysis is underway to determine the direct cost and the cost-effectiveness of the intervention.

In summary, a 10-week Outreach rehabilitation intervention after hip fracture for ambulatory nursing home residents with moderate to severe cognitive impairment found sustained modest

benefits for locomotion and transfers for 12-months. Further work, including a well-powered randomized trial of this program and of multi-modal trials that also include other mobility enhancing strategies (e.g., nutrition, motivation) , should be completed to determine if others find similar benefits and if benefits can be enhanced by focusing on nursing home residents with higher ambulation and functional independence.

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All other authors declare no conflicts of interest.

LEGENDS

Figure 1. Flowchart of Study Recruitment and Participation

* Control participants received usual post-fracture care with rehabilitation services as per facility standard; no rehabilitation logs returned for those who died or were withdrawn by 3 months

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Table 1: Baseline Characteristics of Participants by Group Allocation

	Mean (SD) or n (%)		
	Outreach (n=46)	Control (n=31)	p-value
Participant Characteristics			
Age in years **Categorized**			0.79
< 85	10 (22)	8 (26)	
85+	36 (78)	23 (74)	
Age, years, mean (SD)	89.4 (4.2)	87.7 (6.4)	0.29
Gender, Female	31 (71)	24 (77)	0.44
Comorbidities			0.32
≤ 2	11 (24)	4 (13)	
3 or more	35 (76)	26 (86)	
Walker Type			0.86
Outdoor walker	13 (30)	8 (28)	
Indoor walker	31 (70)	21 (72)	

	Mean (SD) or n (%)		
	Outreach (n=46)	Control (n=31)	p-value
Assistance			0.25
No/Minimum	37 (88)	21 (78)	
Moderate to Maximum	5 (12)	6 (22)	
Proxy			0.89
Family member (Spouse/Offspring)	39 (89)	26 (90)	
Other	5 (11)	3 (10)	
Functional Independence Measure			
$FIM_{physical}$	43.8 ± 18.4	40.4 ± 15.6	0.41
Locomotion Scale	6.1 ± 2.7	5.7 ± 2.3	0.46
Mobility Scale	11.2 ± 4.7	11.0 ± 4.4	0.85
EQ-5D-3L	0.55 ± 0.28	0.46 ± 0.20	0.14

Surgical and Hospital Data

	Mean (SD) or n (%)		
	Outreach (n=46)	Control (n=31)	p-value
Fracture type			0.30
Femoral neck	15 (33)	13 (42)	
Trochanteric	30 (67)	18 (58)	
Hospital complications			0.64
Yes (*1or 2 complications*)	7 (15)	6 (19)	
Hospital days			0.13
Median (IQR)	7 (5-10)	8 (6-12)	
[range]	[3-18]	[3-18]	
Surgery days			0.47
Median (IQR)	1 (0-1)	1 (1-2)	
[range]	[0-4]	[0-3]	
Postoperative rehabilitation start days			0.06
Median (IQR)	1.5 (1-2)	1 (1-2)	

	Mean (SD) or n (%)		
	Outreach (n=46)	Control (n=31)	p-value
[range]	[1-3]	[1-4]	

Legend: SD: Standard Deviation; FIM: Functional Independence Measure; EQ-5D: EuroQuality of Life 5-Dimensions 3-Level, IQR: Interquartile Range

Table 2: 3-month Comparisons of Function by Group Allocation

	Mean (SD) or n (%)			**Effect Size**
	Outreach (n=32)	Control (n=23)	p-value	**Cohen's D**
Functional Independence Measure Scores at 3 months				
FIM_{motor}	30.7 ± 16.1	23.3 ± 14.9	0.09	0.475
Locomotion Scale	3.8 ± 2.6	2.5 ± 1.2	**0.02**	0.586
Mobility Scale	6.7 ± 4.3	5.1 ± 4.5	0.20	0.358
Percentage Change (Reduction) in Functional Independence Measure Scores from Baseline to 3-months				
$FIM_{physical}$	28.7 ± 34.1	39.4 ± 23.7	0.21	0.355
Locomotion Scale	29.9 ± 46.8	46.4 ± 29.9	0.12	0.408
Mobility Scale	36.1 ± 41.4	49.0 ± 33.2	0.20	0.338

Legend: SD: Standard Deviation; FIM: Functional Independence Measure

Table 3: 12-month Unadjusted and Adjusted Functional Independence Measure ($FIM_{physical}$, Locomotion and Mobility), and EuroQol-5D-3L (EQ-5D-3L) Scores

	FIM_{motor}		**Locomotion**		**Mobility**		**EQ-5D-3L**	
	Coeff	p-value	Coeff	p-value	Coeff	p-value	Coeff	p-value
Factor	(95% CI)		(95% CI)		(95% CI)		(95% CI)	
Univariable Analysis								
Group Allocation								
Outreach (vs Control)	4.92 (-2.08, 11.9)	0.165	0.77 (-0.13, 1.66)	0.091	0.95 (-0.85, 2.75)	0.297	0.08 (-0.01, 0.17)	0.084
Age in years								
≥85 (vs < 85)	-2.87	0.336	-0.24	0.564	-1.50 (-3.00, -	0.049	-0.02	0.696

	(-3.01, 8.75)		(-1.04, 0.57)		0.01)		(-0.09, 0.06)	
Gender								
Female (vs Male)	1.50	0.627	0.22	0.604	0.59	0.459	0.05	0.258
	(-4.61, 7.62)		(-0.62, 1.06)		(-0.98, 2.17)		(-0.03, 0.12)	
Comorbidities								
3 or more (vs ≤ 2)	-3.96	0.234	-0.81	0.070	-0.58	0.493	-0.07	0.099
	(-10.5, 2.59)		(-1.69, 0.07)		(-1.10, 2.27)		(-0.15, 0.01)	
Pre-Fracture Walker Type								
Outdoor (vs Indoor)	11.17	**<0.001**	1.87	**<0.001**	3.58	**<0.001**	0.12	**<0.001**
	(5.83, 16.5)		(1.16, 2.59)		(2.25, 4.91)		(0.05, 0.20)	
Support/Aid								
Yes (vs No)	4.84	0.128	-0.32	0.478	-0.58	0.475	0.04	0.386

	(-1.41, 11.1)		(-1.21, 0.57)		(-2.21, 1.03)		(-0.05, 0.12)	
Multivariable Analysis								
Group Allocation								
Outreach (vs Control)	6.99	**0.017**	0.86	**0.023**	1.54	**0.041**	0.11	**0.009**
	(1.28, 12.70)		(0.13, 1.60)		(0.06, 3.01)		(0.03, 0.18)	
Pre-Fracture Walker Type								
Outdoor (vs Indoor)	13.98	**<0.001**	2.22	**<0.001**	3.74	**<0.001**	0.18	**<0.001**
	(7.70, 20.25)		(1.41, 3.04)		(2.11, 5.36)		(0.09, 0.26)	

Random effect was the intercept (that indicates the average score at baseline) and time; all other factors were treated as fixed effects.

All models are adjusted by time and time-square.

Legend: SD: Standard Deviation; FIM: Functional Independence Measure; EQ-5D-3L: EuroQuality of Life 5 Dimensions 3-Level

Table 4: Outreach Program Delivery

	Week 1	Week 5	Week 10
Bed Mobility*	77%	82%	57%
Transfers*	57%	67%	61%
Functional Exercises*	77%	91%	89%
Ambulation*	67%	88%	96%
Median Distance in feet (IQR)	68 (11,151)	152 (73, 417)	331 (163, 480)
Median Walking Sessions (IQR)	1.5 (1, 2.5)	2.7 (1.7, 3.5)	2.7 (2.0, 3.3)

LEGENDL IQR = Interquartile Range

* Proportion of treatment sessions that included these program components

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Figure 1.

Caption - Flowchart of Study Recruitment and Participation

* Control participants received usual post-fracture care with rehabilitation services as per facility standard; no rehabilitation logs returned for those who died or were withdrawn by 3 months

Figure 1. Flow Diagram of Recruitment and Participation